

DIRECT WRITE ALL-GLASS PHOTOMASK BLANKS

ABSTRACT

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range of
A narrowly defined zinc silicate glass composition is found to produce High Energy Beam Sensitive-glass (HEBS-glass) that possesses the essential properties of a true gray level mask which is necessary for the fabrication of general three dimensional microstructures with one optical exposure in a conventional photolithographic process. The essential properties are (1) A mask pattern or image is grainless even when observed under optical microscope at 1000x or at higher magnifications. (2) The HEBS-glass is insensitive and/or inert to photons in the spectral ranges employed in photolithographic processes, and is also insensitive and/or inert to visible spectral range of light so that a HEBS-glass mask blank and a HEBS-glass mask are permanently stable under room lighting conditions. (3) The HEBS-glass is sufficiently sensitive to electron beam exposures, so that the cost of making a mask using an e-beam writer is affordable for many applications. (4) The e-beam induced optical density is a unique function of, and is a very reproducible function of electron dosages for one or more combinations of the parameters of an e-beam writer. The parameters of e-beam writers include beam acceleration voltage, beam current, beam spot size and addressing grid size.

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